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TUBERCULOSIS IN SCHOOL CHILDREN.

(A General Review, with personal  
notes and Experiences)

by

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So far from Tuberculosis existing within strictly defined limits of incidents, it is now agreed, by practically all authorities, that it is ubiquitous, and that infection from the Tubercle Bacillus may be considered unavoidable.

To the vast evidence of skilled observers in many lands, obtained from Clinical and Post-Mortem resources, have more recently been added, the striking results of the various Tuberculin tests, to which reference at greater length will be made later.

Taking the Von Pirquet Vaccination test, as one of the most frequently used, we find that Calmette from his own observations, and from a careful review of those of many other observers, found, that a Positive Reaction is obtained in

53% of children, in the Age Period 2-5 years,  
and

80% of children, in the Age Period 5-15 years, these being the periods corresponding with the full term of school life in Elementary Schools. Hamburger says, in short, that the Tubercular Diathesis is universal, and that among the poorer classes, 95 per cent. of children, are infected with Tuberculosis during School Age, (Ref. Allgemeine Path. und Diagnost. d. Kindertuberculose Leipzig und Wien 1910 S. 98, also Zeitschrift für Schulgesundheitspflege), while recently McNeill has given some interesting figures, from a series of tests made at the Sick Childrens Hospital, Edinburgh. (McNeill, British Medical Journal, Sept. 21st, 1912. Tuberculosis in Infancy and Childhood).

His figures corroborate those of Calmette although the percentage /

percentage is not quite so high. Viz.-

In 75 cases - at Age Period 3 - 4 years, a Positive Reaction was obtained in 46.6 per cent.

" 52 " - at Age Period 5 - 6 a Positive Reaction in 28.8 per cent.

" 79 " at Age Period 7 - 10 a Positive Reaction in 51.9 per cent.

and in 40 " at Age Period 11 - 14, a Positive Reaction was got in 55.0 per cent.

With these figures representative of many others of a similar purport, (Ref. Still - Common Disorders and Diseases of Childhood 1910. P. 350, also Holt. Diseases of Infancy and Childhood 1907. P. 1071) one may be justified in making the assumption that Tuberculosis is practically universal among School Children, whether in a latent or a manifest form.

In Infancy the Mortality from Tuberculosis is heavy. As the child grows older the Mortality rapidly diminishes. To put the matter in other words - Tuberculosis is of extreme danger to the life of the child, but once that period is passed, a mild infection, is probably of considerable protective value during the first two decades of life.

Is this mild infection, which may confer partial immunity, derived from a human or Bovine source ?

This opens up the large question of Human and Bovine Tuberculosis ; their common or diverse characters, their interchangeability, intercommunicability, and so on. It will be better to refer to this briefly now.

Let /

Let it be at once said that the balance of evidence is all against Koch's dictum, that Human and Bovine Tuberculosis were different and that the Bovine Tubercle Virus was not conveyed to man. (That there is a great difference in the usual results of the two infections will be referred to again, but this is not the point at issue).

The natural Corollary to this was, that all our efforts towards obtaining a Tubercle free Milk, butter and meat supply, among other things, were acts of super-erogation.

The evidence of the English Royal Commission on Tuberculosis, and of the German Imperial Commission, and of many of the best observers in all countries, is in favour of there being two types of Tuberculosis - a Human and a Bovine, either of which may attack the child. Of recent date, a large and important work has been, and is now being, done, on this far-reaching subject by well-known Tuberculosis experts in Edinburgh. Although definite findings, from the researches of Messrs Harold Stiles, John Fraser, Charles McNeill and others, have not yet been published, the apparent trend is towards the establishment of the position, that, while the Bacteria themselves may be always definitely distinct, and do not become transformed into each other, they each - Human and Bovine Tubercle Bacilli - produce Tuberculosis, and, speaking generally, of a markedly different character. From the researches and experiments of Mr Fraser, it seems likely to be demonstrated that, at any rate, (if not all so-called Surgical Tuberculosis) that of the Bones and Joints is solely of /



of Bovine Origin. (Ref. Fraser. British Medical Journal, Nov. 23rd, 1912. P.P. 1432 et seq.)

Dr. Nathan Raw corroborates the findings of Calmette. He bases his views on the observation of 5000 cases, made over a period of fifteen years. Dr. Raw holds strongly that in Human and Bovine Tubercle, we have two varieties of a common species, either or both of which may attack the human body ; that the Bovine Tubercle Bacillus is mainly responsible for what we call Surgical Tuberculosis i.e. of Glands, Bones and Joints, of Meningeal and Acute Miliary Tuberculosis and possibly of Lupus ; while, on the other hand, the Human Tubercle Bacillus, produces Pulmonary Phthisis, Tubercular Ulcers of the Intestines, and Tuberculosis of the Abdominal Glands. The sufferer from Surgical Tuberculosis is rarely the victim of Pulmonary Phthisis, being vaccinated against it, by the Bovine infection, while, conversely, the typical patient with Pulmonary Phthisis rarely exhibits any other manifestation, save Tuberculous Ulcers of the Intestine, being immunised by the Human Infection. (Ref. Dr. Nathan Raw. Kelynacks Tuberculosis in Infancy and Childhood, also, British Medical Journal, Feby. 1st, 1913.)

Into this vexed question I need not enter further but shall have cause to refer to it again, when discussing Prophylaxis.

Tuberculosis in Childhood, possesses well-marked features, peculiar to this epoch.

Whatever the Portal of Entry may be - by Ingestion or Inhalation /

Inhalation - the one thing certain in childhood is, that the Lymphatic Glands are the first structures to show actual Tubercular involvement. The Tubercle Bacilli, entering the body, by Ingestion or Inhalation, may take first lodgement, in the Tonsils, in Adenoidal Tissue, or in cracks and abrasions of the Mucous Membranes. It has been shown that Tubercle Bacilli may make their way, through the Intestinal Walls, although intact and without lesion.

To this attack of Tubercle Bacilli the Lymphatic Glands form the main line of defence. These structures are highly developed in early life, and mechanically arrest the Bacilli.

In Infancy, this arrest is purely temporary, and a spread to vital organs rapidly follows, this being shown by the high morbidity and mortality from Tuberculosis in children up to one year.

In later years of childhood, the glands hold the infection, and thus form clinically, the Primary Focus, from which the disease may or may not, spread to other structures.

There are thus two well-marked stages of the disease - a first stage, in the Glands - Manifest or Occult, and a Second stage when the disease has overstepped these, and appears in other parts.

These manifestations are generally broadly grouped, as,

Surgical Tuberculosis

Manifest

Tuberculous Glands, Bones & Joints, and Skin.

and Medical Tuberculosis

-

Manifest or Occult.

Pulmonary /

## Pulmonary Phthisis, Pleural and Peritoneal Tuberculosis.

As one, that, after many years of busy practice in large cities, has now for two years been engaged in School Medical Inspection, throughout the whole of an English County (Northamptonshire), which although of moderate density of population, has a disproportionate amount of Tuberculosis, I, naturally, am keenly interested in this subject. There are high hopes, that, in the near future, we shall be able to bring into working, well-oiled machinery, to save our efforts for the well-being of these children of the poorer classes, being stultified as they have, unfortunately, often been in the past. I am trying to give in this Thesis, a general account of the whole question of Tuberculosis in School Children, within illuminating notes entirely from my own experience.

### DIAGNOSIS.

The chief point of importance in Diagnosis, is to find out whether Tuberculosis is Active, Latent or Occult.

It is generally Active or Manifest in children that have been infected in the earliest years of life, while Latent in children, that have received infection in later years (Ref. Hamburger. *ut autea*).

Methods of Diagnosis may be divided into

1. Special Diagnostic Methods.
2. Physical Diagnosis.

Let /



Let us first run over the points of some of the chief methods used under Group 1.

(a) Diagnosis by the injection of old Tuberculin.

This is the old Tuberculin of Koch-T. or T.O. - a filtered Glycerin Bonillon culture of T.B. of human origin. - Incubated for six weeks at  $37^{\circ}$  C. - Evaporated to one-tenth its bulk over a water-bath at  $70^{\circ}$  -  $80^{\circ}$  C. - then filtered through porcelain - to exclude the Bacilli.

The Filtrate is T., and is mainly a solution of the extra-cellular toxins, with some Endotoxins.

Using strict aseptic precautions, the injection is made, strictly subcutaneously, in the abdominal wall, just internal to the anterior superior Iliac Spine, or between the Scapulae, or in the outer side of the Upper Arm.

The general first dose for a child is 0.001c. c., increasing up, say, for a third dose to 0.0025 c.c.

This test is not to be used lightly, but is mainly indicated in doubtful or difficult cases.

There are many contra-indications to its use. For Example - A temperature over  $99.5^{\circ}$  F.

Suspected Military Tuberculosis.

Recent Haemorrhages.

Suspected Renal or Cardiac Disease.

We need not consider it further as of much help.

(b) Von-Pirquet's Test.

Of several cutaneous tests, this has recently assumed a position of importance. The seat of election is usually the /



the skin of the upper arm or the inner side of the Forearm. A special Von Pirquet Scarifier, or any suitable sterile instrument, may be employed.

The skin having been cleansed with Ether, three spots are scarified, one through a drop of sterile water, as a Control ; the other two through Tuberculin of different strengths, although some use one mark only - besides the Control - through Undiluted Tuberculin.

After a few seconds the Tuberculin is wiped off.

A Positive Reaction shows Erythema, Hyperaemia and Exudation, with the formation of a Papule of varying size, generally of a minimum of 10 m.m. or  $\frac{2}{5}$  inch.

Von Pirquet says that a Reaction of  $\frac{1}{5}$  inch should be noted, as possibly Positive.

The Positive Reaction is observed in from 24 to 48 hours (maximum).

The Negative Reaction is similar to the traumatic reaction of the Control Spot, and analogous to that seen so often, in ordinary unsuccessful vaccination against Small Pox.

This test is very useful in children up to three years, and to a less extent in early school life. This is evident, if we grant the presumption that over 90% of all adults react to this test.

The Reaction may be absent, however, in very advanced cases of Tuberculosis, and also in some rapidly acute cases, from super toxicity.

In Germany the general opinion is "that after two or three /

three years of age, a Positive Reaction gave no reliable indication of Active Disease" (Ref. Ann. Report. 1911. Chief M.O. Board of Education).

In routine examination of school children, it cannot be used, although in the future developments of our present scheme its usefulness might be greater.

(c) Moro's Ointment Test.

This is on similar lines. An ointment is prepared with Koch's Tuberculin and a Lanoline base. This is rubbed into the skin of the abdomen, chest or inner forearm.

A Positive Reaction shows in 24 - 48 hours, as an Erythema and a Papular Eruption.

It is contra-indicated in the case of children with any rashes, with spotty-looking skins, or of Tuberculous appearance.

(d) Calmette's Ophthalmic Reaction.

A one % solution of Old Tuberculin in sterile water is used, - having got rid of the Glycerine, by precipitating with Alcohol. One drop is instilled in one eye, while, as a control, one drop of sterile water is put into the other eye.

A Positive Reaction shows an injected and inflamed Conjunctiva in from 3-6 hours. Emmett-Holt considers this Reaction of great value in 1% solution. In three hundred and thirty five children, presumably non-tubercular, no reaction was got. (Ref. Emmett-Holt. Kelynack. Tuberculosis of Infancy and Childhood).

(e) /

(e) Wolff-Eissner used for children a half ( $\frac{1}{2}$ ) per cent. solution of Old Tuberculin in "Physiological Salt". He asserts that a Positive Conjunctival Reaction shows active Tuberculosis, but this is not proved.

It has been stated that a Positive Reaction has been obtained in Non-tuberculous adults after hard reading, the night before.

Any previous eye affections contra-indicate the use of these Ophthalmic Reactions.

Like the other tests they are not of practical value in Routine School Inspection, as it is impossible to watch the progress of the Reaction.

(f) The Opsonic Index.

This is the ratio of the Opsonic power of a Tuberculous person's blood Serum to the Opsonic power of a normal person's blood serum. The theory, briefly stated, is that the Phagocytic power of the Leucocytes, depends little on themselves, but on the extent to which they are sensitized, by the substances named by Sir Almroth Wright - "Opsonins" - in the serum. Resistance to Bacteria depends on the quantity and power of the "Opsonins". "Opsonins" has never been isolated, although it appears fairly stable, and does not deteriorate for at least twelve hours. (Ref. Muir and Ritchie's Bacteriology. PP. 112. 261. 484).

The Opsonic power of a serum is estimated by the rapidity with which the Polynuclear White Corpuscles devour the Tubercle Bacilli. To find the Opsonic Index of a Tubercular Serum /

Serum, we have to find

- (1) The Opsonic power of a Tubercular Serum.
- (2) " " " " " Normal "

There are three requisites.

(a) An Emulsion of Serum-free Leucocytes.

Let 10 drops of blood fall into a C.M. tube, nearly full of an 85% solution of salt, and a 1% solution of Sodium Citrate (to prevent coagulation). Mix and centrifuge.

Pipette off the clear fluid ; then, to get rid of the Sodium Citrate - fill with Saline. Shake and again centrifuge.

(b) An Emulsion of Tubercle Bacilli.

Take a piece of growth on potato. Grind it in an Agate Mortar, with 1% saline solution to make a thick milky liquid. Dilute till but slightly turbid. This will contain Tubercle Bacilli. Singly and in clumps.

Centrifuge for 3 or 4 minutes to get rid of the clumps. The supernatant fluid will then contain single Bacilli.

(c) The Abnormal Serum.

Collect the blood from the patient in a Capsule, and allow the clot to settle.

Take a Wright's Pipette. Aspirate half an inch of (a) Leucocytes, and allow an air bubble to enter next half an inch of (b) T.B. Emulsion and another air bubble, and finally a half inch of (c) the Abnormal Serum. Throw out on a slide, and re-aspirate several times, to get them thoroughly mixed. Finally aspirate and seal the end of pipette.

Incubate /



Incubate for 20 minutes, by which time the Leucocytes will be ingesting the Tubercle Bacilli.

Break the point of the pipette, and spread a small quantity of the mixture with another slide on an angle of  $60^{\circ}$ . Dry, fix and stain with Ziehl-Neelsen.

To get the Opsonic power, count the number of Bacilli ingested by the first fifty Leucocytes, seen in the field. Do the same process with a Normal Serum, and find its Opsonic power. Then the ratio between them is the Opsonic Index.

For example, if we get 60 with the abnormal, and 70 with the normal serum, the Opsonic Index would be  $\frac{60}{70}$  or roughly 0.8.

After an injection of Tuberculin there is a stage, known as the Negative Phase, during which the Opsonic power is diminished, and presumably the resisting powers of the body is lowered - the patient feeling worse - This Negative Phase may last about a fortnight, and is followed by a Positive Phase, in which the newly formed Opsonins enter the blood.

Subsequent injections of Tuberculin are to be given, only during the Positive Phase, or when it is just waning. If a subsequent injection be given during a Negative Phase, a second Negative Phase would probably be super-added with bad results.

With repeated injections, given during a Positive Phase, we should hope to get a succession of Positive Phases with a rising Opsonic Index.

Necessarily the Index must be taken every time, to learn /

learn whether the Phase is Negative or Positive. A Negative Phase after the first injection of Tuberculin, is supposed to occur only if the subject is Tuberculous, so that the absence of a Negative Phase, would presume the Non-existence of Tuberculosis.

I have entered into full detail of this subject, from its relation to Tuberculin treatment, which is now assuming importance as a curative agent in the Dispensary and other schemes about to be brought into being. It is not for me to enter into the question of the correctness of this Opsonic theory, but, right or wrong, it has been the cause of a powerful stimulation of thought and action, on the whole question of Serology, Susceptibility, Immunity and Cognate matters. (Ref. Personal notes on Bacteriology, etc., made in Edinburgh, and at West London Hospital).

All these special diagnostic tests have one permanent draw-back. They do not locate the site of disease. On the assumption that the causal agent in Pulmonary Phthisis is the Human Tubercle Bacillus, while the Bovine Bacillus causes Surgical Tuberculosis attempts at a rough Differential Diagnosis, have been made by scarifying with Human and Bovine Tuberculin and noting the strength of the Reaction. Detre found 90% of cases of **Pulmonary** Phthisis gave a strong reaction to Human Tuberculin, while 40% of Abdominal and Surgical Tuberculosis cases gave a more pronounced reaction to Bovine Tuberculin. This, even if correct, would be only a rough guide, and we are again brought back to Diagnosis from Physical Signs and Symptoms. /

Symptoms.

## 2. Physical Diagnosis.

### (a) In Pulmonary Tuberculosis.

To note Abnormal Conditions, one must have a sound knowledge of the Normal, so it will not be out of place to give a short resume of the Normal Condition of the child's chest.

#### Limits of the Lungs in the Child.

##### Right Lung.

In the Mammary line from the Clavicle to the 6th Rib.

In the Mid-Axillary line- down to the 9th Rib.

Posteriorly - down to the 10th Rib.

while the

Left Lung - reaches down behind to the 11th Rib.

Normal Dulness is found over the heart, liver and spleen, and on the right side, anteriorly, from the 4th to the 6th Rib, from which, to the Costal Margin, the note is flat.

On the left side above the spleen at the level of the 6th rib, a narrow strip of relative dulness, due to the left lobe of the liver, under the Diaphragm, has been described by Fleischmann.

Posteriorly - there is slight dulness in the supra-spinous fossae, and on the right side, liver dulness from the 7th Dorsal Vertebra - downwards.

The amount of Lung Tissue above the Clavicle cannot be mapped out in infants and young children. Consequently we find that the apices (which Professor Keith in a recent lecture, described /



described as having been developed in connection with the erect posture) are not the first Pulmonary Region to be attacked by Tuberculosis in children.

Vocal Fremitus, which may be ascertained by getting the child to count or talk, (or cry), is normally well marked along the posterior border of the Axillae, and most marked in the mid regions, and between the scapulae behind. Abnormally, of course, Fremitus is increased by solidification of Lung Tissue.

Vocal Resonance, has a much lower pitch in the child than in the adult, and is somewhat less marked in front in the right Infra-Clavicular Region than on the left side, while the note is said to be slightly higher and shorter.

Tympanitic Resonance, is normal in the left Axilla, sometimes even high up.

A proper knowledge of the breath sounds, and the ability of appraising any deviations from the assumed normal, at their correct value, is of the greatest importance in Pulmonary Diagnosis in the child, for we always have to remember, that what would be abnormal to the Auscultating Ear in the adult, may be normal in the child.

Up to ten years of age, there is found Intensified Vesicular or Puerile Breathing, which may belong to one of three types.

- (a) With coarse inspiration, and Vesicular or nearly inaudible expiration.
- (b) Both inspiration and expiration, intensified and coarse.
- (c) /



(c) Inspiration, low and Vesicular, expiration coarse.

The points of difference may be put thus.

Puerile Breathing

V.

Bronchial or Tubular

Sounds are

Sounds may be Tubular

distinctly Bronchial but not  
Tubular.

Sounds are

Sounds are

more marked on Inspiration.

more marked on Expiration.

On the right side - beneath the Clavicle, and over the spine of the Scapula - the Expiratory murmur is always more intense.

This is most important from the point of view of a too ready diagnosis of Right Apical Tuberculosis, and yet it is not too lightly to be taken for granted that all is quite Normal. (Ref. 1911 Ann. Report. C.M.O., B. of E. P. 70.) Posteriorly we get the Respiratory murmur down to the 11th Dorsal Vertebra, especially on the left side.

Broncho-Vesicular Breathing, is normal in the Inter-Scapular Region. This again is of the greatest importance, as Pulmonary or Introthoracic Glandular mischief may be suggested. The greatest acuteness is needed to properly estimate the value of the sounds heard in this region; a region that counts so largely in Tuberculosis of the Intro-thoracic Glands, but to this we shall refer later when touching on Regional Diagnosis.

The so-called "Central Pneumonia" may be diagnosed, and Schick's Expiratory Stridor, said to be significant of Enlarged Tracheo-Bronchial Glands, may be confused with this type of breathing. /

breathing. Personally, I always have great difficulty in making up my mind, about the sounds in this region. But after years of examination of the normal and abnormal chest, an intuition, coupled with the broad signs of well or ill-being, helps one out, fairly often, on the right side.

Bronchial Breathing is normal over the Trachea and Upper Sternum. (Ref. Koplik. Diseases of Children. P.p. 611 et seq. and P. 644.)

Having thus briefly run over the salient points with respect to the child's normal chest, we must now touch rapidly on the Physical Diagnosis of Pulmonary Phthisis.

We do not generally feel able to give a positive diagnosis of incipient Pulmonary Tuberculosis, unless Bacilli (T.B.) are demonstrated in the Sputum. Did we depend entirely on this, a great deal of valuable time would be lost, as the Disease may exist for months, while Bacteriological reports are negative. It is not always easy to obtain Sputum from a child. Emmett-Holt describes a method of producing an artificial cough by means of tickling the fauces with a forceps or spatula covered with sterile gauze, on which the resulting sputum is collected. The results however appear to be most often negative (Ref. 1911 Ann. Report. C.M.O. Board of Education, P. 71).

The thick jelly like parts of the sputum are to be examined.

The Bacilli owing to a waxy substance surrounding them or in their composition, do not take up stains quickly in the cold. So strong stains such as Undiluted Carbol Fuchsin must be /

be used, hot, and for a long time. Once the Tubercle Bacillus is stained, however, it holds the stain tenaciously, it not being removed by 20%, 30% Sulphuric Acid, nor by Alcohol. The T. Bacillus is thus known as Acid and Alcohol fast.

Under the microscope it is a slender rod, with no characteristic arrangement. Recent specimens stain uniformly while old specimens, sometimes seem to stain in an irregular granular way. The significance of this is in dispute.

Culturally the Bacilli are of slow growth.- Aerobically on Glycerinated Media, e.g. Potato - taking 6 weeks to form a well marked warty growth.

These notes, into which I have drifted are rather far from my standing point of Physical Diagnosis to which I must now revert.

Percussion - may often give evidence of Pulmonary Lesion before Auscultation. In fact, some of the best Clinicians I have known, pin their faith almost wholly to Percussion.

I think myself that this "Percussion Sense", although it may be much increased in any one by care and constant exercise, is, in its higher flights, a gift.

In Routine School Examination Percussion is usually done in the erect position. This is not quite satisfactory, at any rate, in the case of children, who sway about hopelessly sometimes even with light percussion. There ought always to be facilities for percussing the child anteriorly and posteriorly if necessary in the recumbent position. Posterior Percussion seems /



seems fairly satisfactory in the bent erect posture.

In the child, as before indicated, the earliest Tubercular processes (so far as the Lung itself is affected) are to be found, as a rule, in an area from one to one and a half inches below the Clavicle. That is to say, the earliest processes in the Lung itself, begin in the upper portion of the Lower Lobe, or the lower portion of the Upper Lobe.

Dr. Lees has mapped out six areas, where dulness on Percussion has to be specially looked for in Incipient Pulmonary Phthisis - two in each Upper Lobe, and one in each Lower Lobe. (Ref. Dr. Lees. Diagnosis of Incipient Pulmonary Phthisis. B.M.J. Nov. 9th, 1912).

These correspond in general, with the area one finds first affected, although I do not think it possible to define with such precision, and to make their enlargement or diminution, in the case of children of early school age.

Still I agree with him, when he gives Percussion the post of honour, although Auscultation, being so much easier - or apparently so - is more commonly relied on.

We may often get areas showing a well marked alteration in Percussion Note, while Auscultation may show nothing more tangible than a slight weakness of air entry.

A difficulty arises often as to the significance of the impaired note:- Whether it denotes an area of active processes, a latent Tubercular focus, a cured Tub. process with Pulmonary Scar, or a thickened Pleura. Small patches of Pleuritic thickening are very common in young children, the Active Pleurisy, having been, as Rheumatism often is, undetected, or passed over /



over lightly.

Auscultation affords us sounds of widely differing degree and type.

Interrupted or Wavy Breathing - "Respiration Saccadee" has been given a prominent significance by some. I have found it so common in children, as to attach no Pathological consequence to it whatever. As has previously been noted with regard to the Normal Lung Sounds, the importance of distinguishing Puerile Breathing from Pathological Respiration is obvious. Mild Bronchitis is common in school inspection, especially during the winter, and may wrongly suggest, or, at another time, mask Tuberculosis.

During January, among one hundred and forty children in Routine Examination, at Newton Road Council Infants' School, Rushden, I found 82% with Bronchitic Rales to a greater or less degree.

The sounds of an ordinary Bronchitis are, as a rule, coarser, and found in both lungs. "One-sided Bronchitis" is to be regarded with Suspicion, and had better be considered Pulmonary Tuberculosis. In 40% of cases showing evidences of Malnutrition, or "not thriving", or "falling away", I have found impairment of the percussion Note, either about the Nipple on the right side, or between that and the Clairicle, often with no marked modification of breath sounds, while, if Anterior Examination proved negative, there were rarely clear sounds, posteriorly in the Interscapular Region.

The/

The Thermometer, I have found of small value, although some School Medical Officers have made series of observations thereon. In cases of undoubted Plum: Tuberculosis, we are most likely to find a Normal Temp: during the hours at which School Examinations are carried out i.e. from 9.30 - 12. a.m. and between 2 and 4 p.m.

Cavitation is not common. In two years work I have seen only one undoubted case in North End Mixed School, Rushden, and this patient, then a girl of 11, had been Excluded by my colleague, twice previously, and no treatment had been provided.

Loss of Weight, and failure to increase in Weight since last Examination, or known date at which a Weighing was done, is always a point of Value.

A family history, in any way, even the remotest, suggesting possible Tuberculosis in father, mother, brother, sister, or other relatives, ought always to ensure a careful examination. Any cough, especially a cough persisting over a fortnight, or any recent attack of Measles or Whooping Cough, must always put us on the alert. These points will be referred to further under Personal Experiences.

#### Regional Diagnosis.

A rapid survey of Tubercular lesions in regions other than the Lungs may now be taken. First in order of prominence, in accord with modern observation, and touching closely the age-period we are concerned with come the

##### 1. Intro-thoracic Glands.

In young children the Tubercle Bacilli seem able to invade/

invade these glands, without tangible involvement of Lung tissue. At this age, of course, the Lymphatic system is highly active.

There are three main groups.

- (a) Tracheo-Bronchial - at the bifurcation.
- (b) Bronchial - surrounding the Bronchi.
- (c) Pulmonary - at the root of the Lungs.

The following table, compiled from well known observers, taken from Koplik's Diseases of Children, p. 418, may show the importance of these glands as a primary focus or the seat of latent Tubercle.

	Lung.	Bronchial Glands.	Intestine.	Mesenteric Glands.	Primary Intestinal Tubercle	Peritoneum.	Lymphatic Glands.
Bayaird	8080	%		10. 6	%		
Carr	666	%		16. 6			
Dennig	14.7	21. 3					
Grosser					0.052		
Holt			34	%	0		
Northrup	700	%		2. 5			
Still	72	%		23. 4			
Trepinski	90.4	70. 8	17. 4	20. 8		17. 9	75. 8
Kessel		40		9	4. 5		51

Including Mesenteric Glands.

At Great Ormonde Street, the Post Mortems shew that in most children dying of Tuberculosis, the Bronchial and Tracheal Glands together with the Lungs were most often affected.

Hamburger found Tuberculosis of the Bronchial Glands in /



in 97% of 175 children dying of Tuberculosis (Ref. All. Path. und Diag. d. K. 1910 S. 98 et seq.) Apart from other evidence, such as that afforded by the X Rays during life, we may thus take the pre-eminence in early infection of these glands as granted.

Diagnosis is by no means easy, and is often to be inferred, rather than absolutely proved.

The Symptoms are indefinite. There is general ill-health, lassitude, emaciation and cough with Anorexia, fever, and night sweats - in short the symptoms of Pulmonary Tuberculosis.

The cough is regarded by some as Pathognomonic - not paroxysmal as in Whooping Cough, but slight, constant and irritating, probably due to pressure by the enlarged glands on the Recurrent Laryngeal Nerve. Percussion elicits dulness, while on Auscultation we may hear Bronchophony, down to the 4th or 5th Dorsal Vertebra, or according to others a "Bronchial Whisper" close to the spine from the 5th to the 8th Dorsal Vertebra.

Expiratory Stridor - known as Schick's Sign - is significant of the presence of Tracheo-Bronchial glandular enlargement. I have heard this sign, or what I took for it, in 25% of the cases in which other signs pointed to Intro-thoracic glandular involvement.

X Ray Examination is of the greatest service in Diagnosis, when used intelligently. The X Ray Diagnosis, must, however, be made and the signs detailed, without prior knowledge of the physical signs.

If /

If this is not done, one is inclined to be led astray by fitting in our preconceptions as part of the picture shown by the screen.

### Surgical Tuberculosis.

Bone, Joint and Skin Lesions are diagnosed on general principles, apart from Tuberculin tests, so it is unnecessary to labour this aspect.

Tubercular Middle Ear Disease - starting from the Temporal bone - generally proves fatal before five years of age, so is not usual among school children.

The old standing Aural Discharges, met with so often in schools, rarely contain Tubercle Bacilli.

In bone lesions the question of differentiating between Tuberculosis and Syphilis arises. The chief points of distinction may be put for convenience in parallel columns.

#### Tuberculosis.

#### Syphilis.

Affects long bones usually and

near joints. (Epiphyses)

Not painful

Tends to Suppuration.

Exhibits Cachexia

Long bones. (Diaphyses)

Painful.

Non-Suppurative.

Non-Cachectic.

In Country Schools, Syphilis is not likely, while Tuberculosis is common, but in Urban Areas, the presence of either Syphilis or Tuberculosis is equally likely.

### Miliary Tuberculosis.

I have not met this in school work, so I need hardly enter into a Classical description of this or of other special types /

types.

Broncho-Pneumonia, of which we have all so much experience in general practice is very often followed by Tubercular processes. In fact, Tubercular Broncho-Pneumonia is said to be the most frequent form of Pulmonary Tuberculosis in children. The temperature ranges from 99°F. - 102°F. and is long continued. In the defervescent periods we find suspicious signs - dulness and Bronchial Breathing anteriorly near the nipple. The Apex is not commonly affected, at least, not until later. The condition is really not clinically recognisable from Chronic Broncho-Pneumonia. Caseation and death from exhaustion may follow, or fibro-caseous areas may be formed as potential foci of Tuberculous recrudescence. These partially recovered cases probably form the larger number of the school children suffering from doubtful Tuberculosis and persistent ill health and Malnutrition.

#### Treatment.

(1) Prophylactic. - including personal experiences -

Starting from the assumption of the correctness of the modern theories, that we have previously touched on, the word Prophylactic Treatment as meaning Prevention of Tuberculosis - hardly covers the field. We might say that Abortive was more descriptive. However the meaning is clear that when we speak of Prophylaxis against Tuberculosis any act or measure is implied that may help to prevent the occurrence of tangible Tuberculosis of any kind, in young or adult.

Whether we subscribe to the theories of wide spread latency /



latency or not, there is no essential difference in the steps taken for what may be the prevention, of a totally new infection, or the guarding the body against a stirring up of the presumably latent disease.

From one point of view, the universality of Tubercular Infection in the child, might be regarded as useful in conferring immunity, either temporary partial or total. The Analogy of Vaccination, however, does not hold. In the one case we are immunising with an Attenuated Virus, as it were, and without risk in the process, while in the other - that of Tuberculosis - we are letting nature confer on us a doubtful and temporary immunity, at an enormous sacrifice of human life in the process. The question of treatment of the adult pales before that of absolute prevention in the child.

The attitude of nations and individuals towards Tuberculosis has shown a remarkable change within the last twenty years. In my own boyhood the Consumptive tried to the limit of his endurance to conceal his condition. He felt himself an outcast, plague stricken and, of course, incurable. A "Decline" was the favourite means of a gentle gliding exit from the world's stage of the second heroine of the middle and late Victorian novel.

Now the Pendulum has swung, almost too much the other way. The Phthisical subject, will discuss with gush, all the morbid details of his condition, and life at the "Sanatorium" one sometimes hears recorded in almost Epic style. There is no longer the stigma of consumption, and this at least is all to /

to the good.

Within recent years all civilised countries have taken action against the great scourge, and amongst them our own Britain has not been backward.

The "fresh air treatment", at first only in active operation at Phthisical resorts, such as Davos, Nordrach, and other famous centres on the Continent, gradually assumed large dimensions, and Sanatoria - privately owned - began to spring up all over the country.

As these were only within the reach of the comparatively well to do, Local Authorities, in various parts of the country, began to feel it incumbent on them to make provision for the working and poorer classes, and Sanatoria were built at great cost to meet this.

The necessity for elaborate erections soon began to be questioned, and the possibility of doing all that the Sanatorium could do, on a more modest scale, was widely advocated by many.

No doubt this is quite correct, and if we could guarantee the strict attention to Rules and Regime of the good Sanatorium, equal results might be obtained.

Sanatoria for children are as yet few and far between, but the grants in aid fund set aside under the 1911 Budget is available for this purpose, so far as it goes.

But children of school age suffering from Tuberculosis are most commonly in a fit state to receive education, so the necessity for open air or Sanatorium schools arises. This has been met in some few cases in this country - the more important being /

being those of the London County Council and of the Education Authorities of Birmingham, Bradford, Sheffield, Norwich and Darlington. Doubtless, within a reasonable future, this system will be widely extended.

Now that compulsory notification of Tuberculosis of any kind is general, the first great step has been taken. What is now wanted is the proper linking up of all the agents and agencies at our command, so that so much of our work should not be stultified, as has happened in the past.

What is wanted is the intimate co-operation of the School Medical Officer, the Medical Officer of Health, the Tuberculosis Officer, and also a mutual confidence and understanding between the School Medical Officer on the one hand, and the teachers and School Attendance Officer on the other. I have found the greatest interest and keenness on the part of these two last in this county.

We have briefly referred in a general way to the Sanatorium question. A certain body of opinion worthy of respect, is not in favour of Sanatorium treatment, at any rate, on a large scale, by public bodies. Dispensary treatment, following mainly on the lines of the world-known Edinburgh system, is considered more efficacious, and much cheaper.

Dr. Camac Wilkinson, in a recent letter to the British Medical Journal (Oct. 19th 1912), goes so far as to say that, for a given sum of money, Dispensary treatment reaches 70% of cases and gives 70% of successes, while Sanatorium treatment reaches 10% of the cases, with not more than 50% of successes. This /



This may be allowed to rest here. There is no doubt that some form of Dispensary or Tuberculosis Control Centres as they might be called, must be our most potent agency in tackling the cases of Tuberculosis discovered in School Inspection.

A perusal of School Medical Inspection statistics as to cases of Tuberculosis found on examination, shews almost irreconcilable differences in results. Although a variation from 4.5% in Worcestershire to decimal point percentages in many areas, seems to need much explanation, the discrepancy is more imaginary than real. It is certainly not due to the use of special Tuberculin tests, as they cannot, so far, be used in Routine School Inspection.

It may be explained by the varying standard of thoroughness in the examination, but this is not sound. The different interpretation put on chest sounds by equally competent observers, has to be considered - some being much more diffident in making a positive Diagnosis than others.

(Since writing the foregoing, I have read Dr. Leslie McKenzie's First Report on School Medical Inspection, in Scotland. On p. 74 are some quotations from Dr. Rose's Aberdeen Report. The words used by him are almost identical. Dr. Leslie McKenzie enters a 'caveat', and deprecates the "personal equation" as being non-scientific. He refers to the supplementary aids of the Tuberculin tests, which may show susceptibility up to 80%. But surely he does not imply that these cases, which react to Tuberculin, are cases, all of which could possibly be recognised as Clinical Tuberculosis cases, or fit for exclusion, or special treatment! /

treatment! In conversation with newly appointed Tuberculosis Officers, I understand that they have, like the rest of us, to pin their faith to thorough Physical Diagnosis, after all.

On page 75 Dr. McKenzie goes on to say that the "rough traditional terminology" of Clinical Medicine must be recast etc. etc. In theory, we all, of the Preventive Corps agree, but practically Pulmonary Tuberculosis or Phthisis is slightly more worthy of being regarded as a definite clinical entity, than the sore throat of Scarlet Fever. And, while we may regard Pulmonary Tuberculosis and an enlarged Cervical gland, as each being a local manifestation of a general toxic infection (or on Hamburger's analogy to Syphilis - a Secondary) we must not lose all our sense of proportion while the "Search for the Absolute" goes on.)

Before the Insurance Act and the New Tuberculosis Regulations came into operation, when I found a case, possibly with doubtful family history, slight persistent cough, and occasional adventitious sounds strictly localised (yet all not quite definite enough for a positive diagnosis) I marked it down for care and watchfulness on the part of the parents and teacher, at the same time suggesting that the local doctor should be consulted, and the child brought up at next Inspection. Now things are altered for the better, and my percentage of Tubercular and doubtful Tubercular cases has gone up with a bound. I now shift the burden of proof, and notify as Tubercular or Doubtful, so that the local Medical Officer of Health may be able to use his own judgment, and if he had no reason to be /

be on the alert before, he will now note this child's domicile as a possible infected house.

Previously with one examination a year and no organized after care Committees or "following up", one felt fairly helpless. To instance a case in point. Three years ago, my colleague excluded a girl of nine, from a Rushden School, for well-marked Phthisis of a chronic character. Next year she was brought to school to see him. Nothing had been done, and the girl was getting worse. Last year (February 1912) I saw her, and found her still existing in a marvellous way, with small cavities, and evidence of scattered Phthisis, while this year, since my last Report, our chief Tuberculosis Officer, has examined the girl, together with the whole family of ten and the mother (the father died - practically unattended - of Phthisis two years ago), and found four certain Tuberculosis cases, and the rest very doubtful. I sincerely hope that in two years time such a state of affairs will be impossible.

During my two years of work in this County I put my figures at

Actual Tuberculosis	2.5 %
(of all kinds)	
Doubtful Pulmonary or	
Intro-thoracic Tuberculosis.	10 %
Malnutrition, without Lung Signs	
(but requiring strict watching.	20 %.

Children enter school, so long as there are places enough, at three years of age. At first glance, this might seem /



seem of advantage in the early detection of Tuberculosis. I do not think so. Children are difficult to examine properly at this age. The amount of exposure, unless our attention is specially called, is altogether insufficient for a conscientious Examination. If to avoid any possibility of missing anything important, sufficient time was taken for a thorough Examination with adequate exposure, of each child, our Routine here would be suddenly brought to a standstill. Our rate of Inspection is 8 - 10 per hour, and I understand that some Authorities shew a bigger figure than this. With older children, we have more pointers, showing those cases needing a more detailed examination.

A child of three, just entering School, receives a Perfunctory Examination, or, for the matter of that, a careful examination, revealing no weakness. Between three and five years, it may, probably contract Measles and Whooping Cough. Should the teacher detect nothing subsequently, under our present system, or rather our unmodified system, this child would not appear for examination again until the 12 - 13 age period, unless manifest signs of ill health appeared in the interval. As the age period 3 - 5 is the time of the greatest incidence of Measles and Whooping Cough, than which we have no greater wreckers of lung tissue, an examination at five years of age seems more useful. Failing, or apart from, this, I should recommend that every child known to have recently had Measles or Whooping Cough, would have this fact recorded on his or her Inspection Card, with a mark for presentation as a special Case at the next Medical Inspection.

Influenza, I am doubtful of, as, although Pfeiffer's Bacillus/

Bacillus has been found associated with the Tubercle Bacillus, I have generally found Influenza of a mild type in children of School Age (In General Practice, we used to say that children slept two rounds of the clock, and woke up all right. It is possible that the Tubercular immunity, presumably acquired in the first few years of life, confers at the same time a partial immunity to Influenza? Influenza, like Tuberculosis afterwards resuming its full power).

Up to the present, one efforts have had to stop at Exclusion of Tubercular cases, so that they might play about for a Summer. This, of itself, has been productive of good, as on subsequent examination 60% of such cases have been found free from physical signs. Now, to obviate the long wait till next year, I mark all doubtful cases, with a star \* on their Medical Inspection Card. These cases are seen again, together with any others the teacher may think urgent, at a special visit interfoliated among the Continuous Routine Examinations, at a period about halfway between the last and next Routine Inspections. This may seem very far from a system of perfection, but with the "shadow of the ratepayer" aver hovering behind, it is, at least, a step in advance and entirely due to the initiative of my Colleague and myself.

The cause of the prevalence of Tuberculosis, and the greatest obstacle to its prevention and cure, is, of course, the horrible housing of the poor. This has been a truism for years, but improvement comes with leaden foot. Slums are popularly supposed to exist in big cities. The beautiful villages/

villages of the English Countryside, have shown me more bad housing and overcrowding - proportionately than I have seen during an experience that embraces work in London, Edinburgh, Manchester, Liverpool and Preston ( I might possibly yield pride? of the place to some of the tenements with one-roomed houses I have seen in Glasgow).

In villages, even model villages, in Northamptonshire, I have found gross overcrowding. Young men have to postpone marriage for years, for want of a house. In Wellingborough, a town of close on 20,000 inhabitants we have narrow closes, courts and back to back houses. Rock Street Infants' School which drains this slum neighbourhood, has by far the largest proportion of cases of Malnutrition and doubtful Tuberculosis. In Finedon - a small County town of less than 2,000 inhabitants, there are slums equal to those of Ancoats. In Oundle, a fine old town with a public School, containing under 3,000 inhabitants, there are slum properties, one row I inspected, having no back approach whatsoever. Conditions are not nearly so bad in the newer Urban Areas such as Rushden and Desborough. In my daily lectures on Hygiene I ask for the numbers sleeping in one bedroom. I can only give rough numbers, as the real truth is difficult to elicit-

Seven - in one bedroom. Father, Mother and children of ages from 1 - 18 years.

Three cases of this kind have come to my knowledge recently in Burton - Latimer, Thrafston, and Oundle.

Six- in one bedroom. A case in the beautiful village of Badby with 6 people living in a ruined lodge of one and a half rooms also a case in Toade.



Five - in one bedroom in from 5% - 10%.

While four is very common and the window is most likely shut.

At every school I always reserve a certain apace of time for a short Lecture on Hygiene with special reference to the Tuberculosis problem.

I encourage the children, without any depressing talk, to take a keen interest in their own and other's physical well being. The cult of the open window is unceasingly preached, and practical demonstrations are made of the various simple methods of effective ventilation as applied to all sorts of windows. I impress on them the oft-forgotten fact that an hour at night is as long as an hour at day, although they may be unconscious in sleep; that right air is good and not injurious, and how none of them would dream for a moment of sitting during a whole day in a room with doors and windows closed tightly.

The great importance of little things, of slow eating of tooth and finger - nail hygiene is pointed out.

Answers regarding the adoption of the open window are not always quite truthful, but converts are always being made.

That fresh air in motion is not necessary an evil thing or a draught, one tries to impress on these young minds by constant iteration. Were the children only open to impressions from ourselves these hygienic details, would soon cease to be herioc, and become ordinary incidents of daily life.

But the parent, not to mention the Grandparent, is always looming darkly in the background of the picture. To win over/

over these to our ideas, is a much more difficult task, but some progress is being daily made. Already the younger Mothers in most districts, town and country, are becoming much more assiduous in seeing their children well turned out, teeth brushed, hands washed, and at any rate a weekly bath insisted on.

In our county 60% of the Mothers attend the Medical Inspections. This means in many schools over 90% especially in the case of the younger children - those just entered on school life.

The fact that the bigger boys - the leavers, do not, as a rule, care to be "fussed" with the Maternal presence, brings down the average.

On all these Mothers attending, I always try to make some impression, in as kindly a way as possible. Mothers, in general, are now alive to the advantages of school Medical Inspection, and are on the alert to the possibilities of incipient Tuberculosis. In the remoter country districts especially, where the practitioner comes from a center of population, some distance away, the School doctor is at times embarrassed by the role of Official Consultant that is thrust upon him.

One has no diffidence, now, about expressing the fear or possibility of Tuberculosis or "Consumption", in plain words. Mothers seem grateful for the confidence given them, as a very common saying with them is, that "our own doctor will not tell us anything". I do not mean, that one in any way errs against the courtesies due to one's professional brother. But in School work,

work, one is often the first to have the chance of spotting the doubtful case of Introthoracic or Pulmonary Tuberculosis, and of making the parent put the child under regular medical care.

In further reference to any measure that improves the resisting powers of the possible Tubercular, that is, to render the so called "Soil" unfavourable to Tubercle growth, the question of Diet is of importance. This is too big a subject to be discussed in all its aspects in an essay of this kind.

In my daily routine, I never fail to make enquiries as to the amount and the kind of food given, and also the times at which meals are eaten. Most children with evidences or suspicions of Tuberculosis or with signs of Malnutrition are bad breakfast takers, and make their best meals late in the day. These, I endeavour to have provided with at least a glass of milk, or a cup of Cocoa as a luncheon to be taken during the morning play hour 10.45 - 11 a.m. Unfortunately the children that have the least need of special feeding, are the ones that are best provided with extra food. Although no organised attempt at systematic feeding of the poorer children has been made in our area, still in many schools in the remote districts, where many poor children have to walk two miles from "lodges", some provision has been tried. The teacher sees to the children having hot water for their cocoa, and sometimes provides the cocoa itself, while again the Rector or Vicar furnishes milk during the winter months. These sporadic efforts make a poor best.

Any /



Any idea that malnutrition is of the poor town child, and not of the country child, is not borne out by my own observations.

My former district - the Western half of this County - was almost entirely agricultural, with villages and small market towns. My present district, while embracing a large country area of a similar character, at the same time includes large urban manufacturing centres, such as Wellingborough, Rushden and Desborough.

There is thus every opportunity for comparison. To generalise broadly, although some village schools seem to be filled with sturdy rosy-cheeked children, in the majority the nutrition is not so good as in the urban areas. This was particularly so in villages near the Oxfordshire border, where agricultural labour is even less paid than usual, and the main subsistence is bread and lard or dripping, and tea. In the manufacturing areas, on the other hand, questions as to diet would elicit, that bacon, eggs, beef puddings, roast joints, and good nourishment generally, were much more common. (In Desborough the Mistress of the Council Infants School used to implore me to tell the parents not to let their children have so much to eat).

Between two manufacturing areas again, a difference would be found in the incidence of Malnutrition. This depended on the steadiness of employment, and the fact that employment was more diversified. In Desborough, I found very little Malnutrition - this being a modern town with industries, such /

such as Corset making, ironstone and foundry work, in addition to the staple of shoe-making. That is to say, bad trade did not affect all the workers, at once. In Rushden, on the other hand, - a lately grown up town of over 15,000 inhabitants, Malnutrition and Tubercular incidence was high. Bootmaking was here really the sole source of employment.

Referring to my notes I find that out of 650 children examined at the last Medical Inspection, 14 were notified as Tuberculosis, 11 as Pulmonary and 3 as Surgical; 26 as doubtful Tuberculosis, while an additional list of 30 children, showing signs of neglect and lack of food, was handed to the After Care Committee.

In Desborough, as a contrast, out of 200 children examined only 1 definite case of Tuberculosis was reported, 4 doubtful and only two families of notorious criminal parents sent to the After Care Committee.

The Milk question may just be mentioned.

While we hail with joy any act that will guarantee us a pure milk supply, so far as one's experience in School Work goes, it is difficult to trace any casual connection between milk and Tuberculosis. In the Wellingborough schools I made myself an enquiry into the amount of milk consumed by each of 600 children. I received satisfactory answers from about 350 of these.

In only 5% was there a consumption of one pint of milk per day.

In 20% there was a consumption of half a pint of milk apart /

apart from puddings and tea.

In 75% the only milk taken was what was added to tea, coffee or cocoa, or in milk puddings, and judging from my knowledge of the consistency of the latter in working-class homes, the quantity of milk is very small.

That milk is the vehicle by which the Human Tubercle Bacillus is introduced into the body to cause Pulmonary Tuberculosis, I am inclined greatly to doubt.

In 80% of the cases of Tuberculosis observed in our area, a definite history has been found of some relative having had Tuberculosis generally Pulmonary, and in most of these cases the presumption was strong, that at some time or other direct infection had been possible.

On the other hand Bovine Tuberculosis, is almost as certainly conveyed in this manner.

Any evidence that may be gathered from the statistics of milk consumed by these school children would tend to help prove this. Certainly 90% of the cases of Surgical Tuberculosis - mainly of Cervical Glands and of Joints, that I have met in schools, has been amongst the best fed children, and those that took most milk.

Mothers are continually asking, should they give the weakly looking child patent foods, Emulsions, and so on, I repeatedly urge on them the importance of good plain food, well mixed, that strict regularity should be observed with meals, and that the meal should be small, but must be eaten up. Olive Oil as an adjunct to the Dietary, I have managed to make less fearsome; /



fearsome, by off-setting it against Cod Liver Oil as a Drug. The daily use of fresh vegetables is insisted on. Many families of the poorer classes, never have vegetables at all, or at most on a Sunday, and children for the most part are not fond of them, unless in the form of raw turnips and carrots, which, while better than none at all, are not ideal articles of diet for the "finicking" stomach of a weakly child.

Dust in schools and homes as a potent distributor of Tuberculosis Bacillus, has to be reckoned with. Schools, in general, are not washed and disinfected nearly enough. Our larger schools are best looked after in this respect. Daily wet brushing, and weekly washing with Disinfectant, floors, desks, walls and windows, ought to be imperative on the Authorities.

We have lately experimented with Dusmo, instead of saw-dust mixture for sweeping the floors in our larger schools. The concensus of opinion amongst the masters, is that it certainly reduces the amount of dust in the school atmosphere, and if this is so, it is highly important with regard to Tuberculosis. One of our Rushden Schools which had continually to be closed for Epidemics has had a higher average attendance and no closure since Dusmo was introduced about a year ago. This may be mere coincidence, of course, but at any rate, any diminution of the amount of floating dust is to be valued highly.

A true prophylaxis would be on the lines of vaccination for /

for Small Pox. On these premises Dr. Raw has sought to establish a sound method of treatment and of Prophylaxis. To put it shortly, cases of Surgical Tuberculosis are treated with Tuberculin from human sources, and Phthisis Pulmonalis with Tuberculin of a Bovine source.

On the same reasoning, he has tried in a small way Prophylaxis in doubtfully Tubercular or exposed children by vaccination with Bovine Tuberculin. Taking into account the enormous amount of ordinary Anti-Vaccination prejudice existing, (In the urban districts of our area, we get only 20% 25% of vaccinated children in schools) it is academic to suggest the possibility of universal vaccination against Tuberculosis, still, given the evolution of a suitable serum or Vaccine, analogous to that of Vaccinia, it might quite easily be the best solution of the whole problem, together with easy facilities for raising the resisting power of the soil, and helped by the constantly increasing efficiency of preventive medicine in general.

I may here epitomise our efforts up to the present.

1. Cases are diagnosed as Tubercular Pulmonary or otherwise Doubtful Tuberculosis, and Malnutrition.

2. These cases are reported on their case cards with our special remarks and symbols. e.g. The cases of Doubtful Malnutrition are marked with a star, \*, that they may come up again on the first available opportunity.

3. The Head Master or Head Mistress learns verbally the facts as ascertained, and makes a special note of case, for strict /

strict observation and care. e.g. In the case of a country child, coming from a distance, it's food will be specially looked after, and amplified if possible.

4. The parent, if present, is informed of the condition actual, or doubtful, and suggestions made as to special feeding, regularity of meals and hours of rest ; also special rest times, especially just after meals, when as a rule school children rush wildly about. If poor people, the mother is told how she may obtain help with regard to nourishment etc.

5. The Managers (in the case of the small single area school, generally a Church School in this county, the Rector or Vicar usually attends after the Inspection) have a list of these cases put before them, for whom they are to do what they can, either personally, or as is often the only means, to stir the heart of the local magnate. In the case of the large urban areas, e.g. Rushden and Desborough, a large and interested Managers Meeting is always obtained. Then these cases are discussed at length, and a list made for the School Attendance Officer, and for the After Care Committee.

By these means alone, poor as they are in many areas, owing to slackness and want of means, a great deal of good has been done. As has been mentioned before, in the case of children excluded with suspicions of Tuberculosis for 6 months, about 60% show no signs on Re-examination, while the remaining 40% is made up of cases in which the Tubercular processes were well developed at time of exclusion, belonged generally to ill-nourished /



nourished families, and for whom nothing was done. This is shown by quotations from my recent report to the Managers and After Care Committee of Rushden, (which is at the same time, one of the most commendable areas).

Extract:- North End Council Mixed - Ivy Line.  $13\frac{6}{12}$  reported on for three years - nothing done.

Alfred Street Council - Boys. Herbert Lill - A marked case of three years standing - treatment inadequate,

and so on in other areas that might be quoted.

Next in the case of Leavers, 12 - 14 years who have been noted as Doubtful, and especially those with suspicious family histories, the question of employment is entered into.

This subject, in its broader aspect, has a recently assumed importance, and the County Council is appointing special employment officers.

Indoor, Sedentary or Boot Factory work is banned to the above mentioned, at any rate for two years to give their physical development a chance.

Under the conditions hitherto existing, we all have had to work at great disadvantage the means at our disposal being limited. This is gradually being improved upon. As our Chief Tuberculosis Officer has only been recently appointed, the scheme of Dispensary and Sanatorium treatment for insured persons (and their dependents) is in the making.

As most of our school children are such dependents, they will come under the scheme on the same or parallel lines.

Even /

Even now our Chief Tuberculosis Officer has been able to visit and make a thorough examination of families, cases in which had been notified by me in school inspection.

e.g. (a) The Lines family - already mentioned - ten members - actually Tubercular or under Suspicion - (Rushden)

(b) Saddington family - at Thrapston - four members - actually Tubercular, three with Abdominal Signs and Sanguineous Evacuations.

(c) Marlow family - at Oundle - three members - all Tubercular.

That it has been possible in the case of an Official, appointed within the last four months, and primarily for adult insured persons, to have helped even to this extent in widely separated parts of the county, is of most hopeful augury for the future.

In the absence of a concrete scheme, I append a few rough suggestions of my own.

1. Any child diagnosed in school as suffering from Tuberculosis, in any Manifest form, should be excluded from Ordinary Elementary School.

The question of exclusion of children with Tubercular glands but unbroken skin, and in good general health, is a difficult one.

At present they would probably be allowed to attend the ordinary school, but later on it is to be hoped they would be sent to an Open-Air School, but not to the same one to which we send the Medical Tuberculosis Cases.

2. These excluded cases should as soon as possible be sent to Open-Air schools as the majority are in a fit-state to receive ordinary education.

Until an Open-Air School was found they would be kept under strict observation so that Open Air treatment and good food be obtained at home. This must be done thoroughly, and if necessary, by Compulsion, and at the public cost, as, after the first burst of enthusiasm, the parents of the poorer classes are apt to become apathetic - if they think the case does not improve, or careless, if in their opinion, the child is doing all right.

The question as to the type of schools, Open-Air, Sanatorium, or Schools of Recovery, to which the actual Tuberculosis cases and the very doubtfuls ought to be sent, must remain open, until our experience is more extensive.

The important point to my mind, is the provision of plenty of ground, so that facilities be afforded the children of not only learning gardening, but also Arboriculture and Forestry. The question of Afforestation is of National importance and from the practical standpoints of restoration and maintenance of the health of the child, and also of making him - in the case of a boy - (although there is no reason why girls should be debarred from this avenue) a skilled wage earner of a high class, this is worthy of attention.

Apart from purely Sanatorium Schools, it would be useful to have Gardening and Forestry centres, to which any boy, and especially those of doubtful physique, might elect to /



to go, after leaving the ordinary school.

3. Special nurses for "following up", must be appointed. They would greatly assist the Medical Attendant - Official or General Practitioner -, in the matter of home supervision, Temperature observations, and weighing.

4. Constant Weighing - at least every week - must be attended to. The weight being an indication of great value.

5. Roughly constructed shelters, and open-air chalets can be improvised for children as has been done by many public authorities, for adults.

6. The cases would be visited at least every week, or attendance made by them at the Tuberculosis Dispensary. More frequent attendances or visits should be made if necessary - the special nurse keeping the Doctor well posted.

7. The arrangements as to how the Dispensary is to be manned whether by whole time official or general practitioner, will depend on local conditions.

8. The question of Tuberculin treatment being used would, at first, rest with the Tuberculosis Officer and his assistants, but later on the skilled practitioner would be competent to judge.

The Utility of Tuberculin in treatment is much called in question. From my own small experience I think it is of manifest value in well selected cases, but, as time goes on, the necessity for its use in treatment will probably cease.

9. Those children, without definite signs, but badly nourished, might continue at ordinary Elementary Schools, under /

under the watchful eyes of the Master or Mistress.

Their names are entered in a Special Doubtful Tuberculosis Register, kept by the teacher, with full particulars taken from the Medical Inspection card, for convenience, opposite each name.

Once every fortnight, either on a Saturday or preferably on a school day, so that evasion would be rendered more difficult, these doubtful cases would be marshalled to the Tuberculosis Dispensary by a Master or Monitor. There the Doctor in attendance would examine them.

Their weights would be taken either by the special nurse or at school, but, at least, once a fortnight.

Their homes would be visited regularly by the special nurse, or by members of the After Care Committee, and constant genial stimulation would be applied towards keeping the home surroundings fresh and healthy, and the food, good, plentiful and well selected.

It is commonly objected to any scheme for good poorer class housing that there is a class of slum makers, who will soon defile the fairest homes provided.

While this may be a partial truth of some whose environment has from birth been vile, it cannot apply to the children and in the transition period, at the risk of a further multiplication of Officials these would be slum makers must be under the rigid regard of the law, and absolutely prevented from reverting.

## 2. Curative Treatment.

I fear that the distinction between Prophylactic and Curative has not been strongly drawn in writing the foregoing but, under this heading, apart from what has already been discussed, I can have little to say. I need not refer to other Curative Measures on Tuberculin lines, such as the I. K. (Immun Korper, Immune Bodies) treatment of Dr. Karl Spengler (Ref. British Medical Journal, October 19th, 1912), or to others on Antiseptic lines, as Continuous Inhalation.

They are not within my experience, although in the case of the latter I do not think it so useful in children as in the case of adults.

Drug treatment hardly comes under my purview, although I have had considerable experience of one Drug in a certain type of case in practice, and with the aid of friendly practitioners have been able to watch its effect, of recent years.

In cases where there are dull areas, with Bronchial breathing, but no pales pointing presumably to a drier process than usual my experience has been favourable to the Exhibition of Creosote or a combination of Creosote and Guaiacol. Capsules containing from a half to one minim of each drug may be given to a child, twice or three times a day, according to age.

I was first led to using this from Dr. Philip's (now Sir R. Philip) recommendation in a brochure of his published some seven or eight years ago but which I cannot trace. A relative of my own, a boy of 14, returned from India, with well marked Tuberculosis of the Right Lung, diagnosed by the P. & O. Doctor /



Doctor, and confirmed by his private doctor at home. After unsuccessful attempts at home Sanatorium treatment, he was sent to me. His condition was bad. No appetite and breathless on the slightest exertion. Constant temperature with Exacerbations after meals and the slightest movements. There was marked dulness on the right side from the Apex to the nipple in front, all over the Right Axilla and in all the Scapular areas behind.

After a fortnights' rest in bed in a large empty, open room, with the exhibition of Creosote and Guaiacöl (ā ā m.l in Capsule) his breathing got better and slower and the temperature became normal, save for a rise of  $0.5^{\circ}$  -  $1^{\circ}$  about 6 p.m.

He then went to Llanbedr Hall, Ruthin, under Dr. Grace Calvert, and the Creosote was discontinued. After six weeks, during which expectoration was obtained, his temperature never failed to go up  $1^{\circ}$  -  $1.5^{\circ}$  after luncheon and at 6 p.m., and after the least exertion.

On appeal to me he was again put on his Capsules and within fourteen days there was no temperature whatsoever after exercise or meals. This was continued, tapering off and missing days, for two months, and at the end of five months he was discharged cured.

In the same way with children who do not, as a rule, expectorate much, and especially in those, as it were, dry cases, I have found the combination of great value.

It seems to act directly to stop the Auto-intoxication

In /

In cases with much expectoration I have never seen much benefit from its use.

I have referred to this because I am positive of this beneficial action having been exerted in a good number of cases.

Further extension of this section is not germane to my subject.

#### Summary and Conclusions.

1. It may be concluded that Tuberculosis is already on the decrease.
2. A saner mind on this subject and that of Hygiene generally is found among the people.
3. Tuberculosis is one of the most readily curable of diseases, granted that we had a free hand and no financial restrictions.
4. Although the bulk of the effort is being directed towards the cure of the adult, the root of the matter lies with the children.
5. It is useless spending large sums of money on Sanatorium and other cures, and sending the case back to unhygienic environment.
6. Above everything the Housing Problem must be tackled vigorously. Rather than wait for slum property owners to become angels, a compulsory scheme, with fair compensation, must be enforced.
7. Tuberculosis in School Children is more wide spread than /

than percentages so far have shown.

8. While special tests may suggest latency in enormous numbers, this is not to be allowed to stagger or overwhelm us. The problem remains to a large extent, the simple one of increasing the powers of resistance, *pari passu* with getting rid of the Infection at its source.
9. Highly trained skill in Physical Diagnosis is still our best help towards discovery.
10. Tuberculosis Vaccination is worthy of a testing trial.
11. Although the strict regulations of the sale of milk, and the maintenance of its purity and quality are of the highest importance (as in regard to a useful food) it is impossible to think that milk conveys human Tuberculosis to the extent commonly supposed.
12. That on the other hand milk undoubtedly conveys Bovine Tubercle, seems certain.
13. That Drug treatment except in so far as it may help General Nutrition and tone is of little value.
14. That there is a great and stimulating hope that, in the near future, (I might hazard a round period of one to two decades) by means of all the agencies at work now, and of those about to be thrown in train, the highly trained Practitioner with skilled nurses at hand, the school Doctor with his friends and lieutenants the teachers and School Attendance Officers, the Tuberculosis Officer, and last but not least the co-operating parent and child, Tuberculosis will be on a much less heroic plane in regard to its incidence and mortality.



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